K7
11/15/88

Torrenga Engineering, Inc.

REGISTERED PROFESSIONAL ENGINEERS & LAND SURVEYORS
907 RIDGE ROAD
MUNSTER, INDIANA 46321

Office 836-8918

November 15, 1988

Merle Colby
Boar of Trustees
Town of Griffith
111 N. Broad Street
Griffith, Indiana 46319

RE: Griffith Sanitary Landfill

Dear Mr. Colby:

The original submittal for the approval of additional fill areas within the Town of Griffiths Sanitary Landfill was reviewed by the Indiana Department of Environmental Management Solid Waste Division in August, 1988. A meeting between the Environmental Management review board, Torrenga Engineering, K & S Testing and Engineering and the Town of Griffith was held on August 26, 1988 at the Town Hall. The Environmental Management Review Board submitted a four page letter of deficiencies with the proposal. A copy of this letter is included at the end of this report. Items one thru twelve were discussed in detail with the review board at this meeting, and solutions were agreed upon. Items thirteen thru twenty of this letter are not requirements for the Griffith Sanitary Landfill and were included for general discussion purposes only.

The most important area of deficiency was the lack of a thorough subsurface hydrogeology study of the affected area. In my discussions shortly after the meeting, with representatives of K & S Testing they stated that a detailed hydrogeologic study was impossible without further soils borings and monitoring wells. This is further backed up by items one and four of the Environmental Managements review board letter, in which they state that additional borings and monitoring wells may be necessary.

K & S Testing began installing the new monitoring wells approximately two weeks after the meeting. They were required to collect samples and thoroughly test the results which is a time consuming operation. I received a preliminary report on November 4, from which I have completed the plans. I have included with this report, a copy of the plans for your review. The final report will be completed on November 17th.

I have scheduled a meeting with the review board for 1:00 P.M. Friday, November 18th at their office in Indianapolis. I am confident that we have met the requirements that they have set and that we will receive approval around January 1, 1989.

Very truly yours,

Donald C. Torrenga
Town Engineer

DCT:re

GRIFFITH SANITARY LANDFILL
FINAL REPORT

PREPARED BY: TORRENGA ENGINEERING, INC.
907 RIDGE ROAD
MUNSTER, INDIANA 46321

PREPARED FOR: TOWN BOARD OF TRUSTEES
TOWN OF GRIFFITH
111 N. BROAD STREEET
GRIFFITH, INDIANA 46319

The Town of Griffith's Sanitary Landfill is owned and operated by the Town of Griffith through its Board of Trustees. The Director of Public Works is authorized by the Board of Trustees to oversee the operation of the landfill. The Director is responsible for the quality of the operation and the maintenance of the site.

The present corporate limits of the Town of Griffith encompasses an area of 7 square miles. The sanitary landfill services only the people and the businesses located within the corporate limits. Private scavenging services and other municipal collection services are not allowed to use the landfill site. This is strictly enforced by the Town in order to preserve the lifespan of the landfill for use by the Griffith residents.

The present population of the Town of Griffith is 17,026 people, by the 1980 census. The population is expected to remain stable, with only minor growth over the next 25 years.

The Town employs 1 person during the regular working hours to operate the landfill equipment. Additional personnel are available through the Department of Public Works. The Town employs one additional full time worker to act as the landfill supervisor. His job description includes the record keeping, permit checking and general supervision during operating hours of the landfill. All records of weight and volume of refuse are maintained. Sanitary facilities for these employees include toilets, hot and cold water, showers, locker-rooms and electrical utilities in the Town Garage.

The collection of refuse is done by a full time staff of workers employed by the Town. They collect the refuse within the boundaries of the Town on a weekly basis. These employees are required to pick up common household refuse, business and commercial refuse only. Any large items are collected by separate vehicles dispatched by the Town for strictly that purpose.

The Town of Griffith's Sanitary Landfill is located at 630 South Colfax Avenue. A detailed legal description and location of the site is shown on sheet one of the accompanying drawings.

The landfill site is bordered along the North side by the Chesapeake and Ohio Railroad right of way, and along the West side by the Chicago and Erie Railroad right of way. The Southern and Eastern boundary lines of the site are fenced in, to prevent unauthorized access. A controlled gate entrance is located in the Southeast corner of the site. Anyone wishing to enter the site is required to pass through a second controlled entrance with signage stating that they must inform the on-site personnel of their intentions, and produce a dumping permit if they wish to unload refuse. Dumping permits are issued by the Director of Public Works to Griffith residents Monday thru Friday during regular working hours. Anyone caught dumping refuse without a signed permit is subject to a $50.00 fine.

The Griffith Landfill is located in an area of Town that is currently zoned I-2 General Industrial District. This zoning classification allows the use of land as a refuse collection area. The Northern, Eastern and Southern boundaries of the landfill property are also zoned I-2. The Western boundary line is zoned R-2 denoting single family residential housing. The topographical plot plan shows the nearest residence to the landfill. The design allows a 600 foot buffer zone between this residence and the nearest point of proposed filling.

The Griffith Sanitary Landfill is bordered along the Northern and Western lines by existing drainage ditches. The location of these ditches is well defined on the accompanying drawings. Currently these ditches collect offsite rainwater runoff. This runoff is diverted to Turkey Creek by way of a series of open ditches, and enclosed storm sewers, along Broad Street. Turkey Creek is under the jurisdiction of the Lake County Surveyors Office and is considered a legal drain. The proposal that is being submitted includes the grubbing and cleaning along with recontouring of these boundary ditches to insure that they will be large enough to contain a 25 year storm episode event. These calculations are attached to this report and are entitled "Exhibit A". The site does not lie within the boundaries of a 100 year frequency flood level, as shown on the Flood Insurance Rate Map, Community Panel Number 185175 0003 C as determined by the Federal Emergency Management Agency.

The landfill operation is designed to handle 137 cubic yards or 27 tons of solid waste per day. These numbers are based upon detailed records of what the landfill has handled in the past. Due to the assumption that the current Town of Griffith population will remain the same or experience only minor growth over the next 25 years, these numbers seem to be accurate.

Access to the dumping site is available by means of the existing gravel roadway. The gravel roadway is composed of approximately 10 inches of compacted gravel over a firm base. The location of this roadway is clearly defined on the accompanying drawings.

The design of the sanitary landfill organizes the filling of the landfill into phases, numbered 5 thru 10. Each of the phases are designed to accomodate two years worth of refuse. They will be completed in sequence beginning in the Southwest corner of phase 5, and ending in the Southeast coner of phase 10. Each phase will be completely excavated down to the maximum depth as shown on sheet 3, prior to the commencement of refuse filling. The maximum depth of excavation for each phase has been determined based on allowing a minimum 10 foot clay substrata to remain below the entire limits of the phase. The proposed operation of the landfill utilizes a combination of both the trench method and the area method of filling commonly referred to as the progressive slope or ramp method. Any sand or gravel seams encountered during the excavation will be completely excavated and sealed from the

cell construction by a 10 foot clay layer. The excavated clay will be stockpiled in the area shown on page 6, to be used as cover material for the daily operation, and the construction of the 10 foot wide clay barrier wall. The clay barrier wall will be constructed by using a bulldozer to push the material into place, at a 1 to 1 sideslope. The bulldozer will repeatedly run up and down the clay barrier wall until it is firmly compacted. Upon completion of each 500 foot section of the clay barrier wall, a 90% standard proctor density test will be done to ensure that the wall is thoroughly compacted. The wall will be constructed as the phases are utilized, beginning with Phase 5. Four foot high wooden lathe will be placed at the outermost points of the wall, every 50 feet. The wall will then be a minimum of 10 feet wide beginning at these survey points. The 90% proctor density tests will be performed by a registered soils engineer, and copies will be submitted as they become available.

The compacted clay liner will be cross staked on a 200 foot square grid. Each wooden stake will give a cut or fill elevation based from the temporary bench mark on site to achieve the desired M.S.L. elevation. Copies of the benchmark circuits and field notes will be kept in the Director of Public Works files for review by the Department of Environmental Management's local inspector if the need arises.

Trucks will enter the phase from the unworked face of the trench and deposit the refuse along the working face. The daily refuse will then be compacted utilizing a John Deere compactor with steel drum spiked wheels, to a maximum thickness of six feet. Clay cover will be placed over each days refuse at a minimum thickness of six inches and compacted. The next days refuse will then be deposited on top of the previous days refuse and the procedure for daily cover will again be performed. This method will be utilized until the entire phase has been filled. At each six foot height an intermittent clay lift cover of twelve inches will be placed. The placement of the twelve inch clay layer constitutes the completion of one lift. Lifts will be maintained in an orderly fashion across the working face, with one after another being filled and completed up to two and one half feet of the final contour grades. The cells themselves will be approximately square with side slopes at 3 to 1. The completed phase construction will be covered by two feet of final clay cover with six inches of topsoil over the final clay cover. The topsoil will be seeded at the completion of each phase of construction. Mowing and maintenance of the seeded areas will be the responsibility of the Town of Griffith Park Department.

The proposed cover material will be composed of clay type soil, excavated from the landfill site. The calculated quantities of clay available on site are attached to this report and titled Exhibit "B". Due to the large quantity of clay necessary to construct the ten foot clay barrier wall around the perimeter of the site, an area has been set aside for the excavation of additional clay. The area is shown on page 6 of the accompanying

drawings. During the construction of the individual phases this area will be excavated as necessary to acquire the needed clay. Additionally this area will be utilized for the stockpiling of clay. A portion of this area is owned by the now defunct Chesapeake and Ohio Railroad Company. Currently the Town of Griffith is attempting to acquire this piece of real estate. Upon completion of the landfill the excavated area will be backfilled and seeded.

During cell and phase construction the overland storm water runoff will be channeled via drainage ditches, constructed as necessary, to the central pump station. The pump station is connected to a sanitary sewer which runs to the sewage treatment plant in Hammond, Indiana. The sanitary landfill has been designed so that ground water and the deposited solid waste will not be allowed to interact. Leachate control will be obtained by the impervious lining of clay described previously in this report. Disposal of the contained leachate will be via the pumping station to the Hammond treatment plant. Ground water monitoring wells have been installed at both shallow and deep depths throughout the site, as shown on the accompanying drawings. Testing will be performed every six months with results submitted for review.

The equipment available specifically for the landfill project consists of one Caterpillar Dozer and one John Deere compactor with steel drum spiked wheels which have proven to be sufficient to handle all of the placement, compaction, and grading work necessary for the efficient operation of the landfill. Backup or replacement equipment, if not available from the existing Town equipment, will be rented as needed from private suppliers. Maintenance facilities are available for the equipment at the Town garage, adjacent to the landfill site. A regular crew of full time mechanics are employed by the Town.

Blowing litter and paper will be controlled by the use of portable snow fences in the immediate vicinity of the working face. Dust control procedures will include the use of cinder cover over intermittent lifts and by the sowing of grass on the final cover.

No burning of waste will be permitted. The use of daily cover will keep any fires in a cell, from spreading to other cells. Fire extinguishers will be kept on the operating equipment at all times, to control small fires. Larger fires will be controlled by the Town of Griffith Volunteer Fire Department.

During freezing weather, cover material will be stockpiled next to the cover retrieval area. It will be covered with leaves or dark tarpaulin to absorb the sun's heat and keep the material workable. Roads in and out of the individual phases will be covered with gravel, crushed stone, or construction and demolition rubble, to ensure passability during rainy or snowy weather.

The supervisor will not allow any salvage or scavenging to be done at any time.

Safety devices will include roll bars on all equipment, and communications to the Town garage for emergency situations. Traffic signs will be provided to promote an orderly traffic pattern to and from the dumping area. No vehicles will be left unattended anywhere on the landfill site.

Bulk refuse is not allowed within the landfill area. Any bulk refuse is stored in a separate area near the Town garage. The bulk refuse is carted offsite by a private contractor for disposal.

The final surface of the completed landfill is designed so that no ponding of precipitation will occur. The minimum grade of the completed site will be 2%, and the maximum grade will not exceed 15 %. Periodic grading will be done to compensate for any settlement that might occur. The sides of the completed landfill will be graded to a three to one slope or flatter, to minimize maintenance and erosion.

Daily cover material will control vectors. If this fails to control vectors effectively, private pest control services will be contracted.

Lateral movement of gases will be negated by the stiff clay substrata and clay barrier walls. Natural venting upwards will be controlled by the construction of vertical vent pipes, as shown on the accompanying drawings. The vent pipes will be installed in each phase after its completion and marked by warning signs.

The landfill is intended to be used as a park upon completion of the project. If this is not feasible, the Town will accept maintenance of the site indefinitely.

"EXHIBIT A"

CALCULATION OF THE MINIMUM DITCH SIZE REQUIREMENTS AROUND THE OUTSIDE BOUNDARY OF THE LANDFILL

1) ASSUMPTIONS
   a) Landfill is completed and elevations are in reasonable accordance with the plans.
   b) Drainage ditches are to be designed to contain a 25 year storm episode.

2) AREA
   (See attached blueprint for the limits of runoff)
   By planimeter the total area = 1,040,982 SF
   = 23.8976 Acres

3) TIME OF CONCENTRATION
   100' @ 2% over average grass surface = 12.5 Minutes
   100' @ 10% over average grass surface = 9.5 Minutes
   950' @ 1% over poor grass surface = 28 Minutes
   Total = 50 Minutes

   Intensity for a 25 year storm episode = 2.7 In/Hr

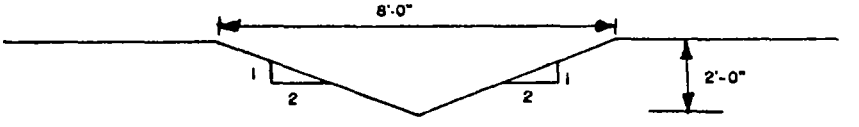
4) RUNOFF COEFFICIENT
   Assumed runoff coefficient = 0.20

5) CALCULATION USING AREA METHOD
   Q = CIA
   = (0.20)(2.7)(23.8976)
   = 12.9 CFS

   From "DATA BOOK FOR CIVIL ENGINEERS"
   By: ELWYN E. SEELYE
   Page: 5-05

   Given: Q = 12.90 CFS
   S = 0.002
   n = 0.030

   Solution: A D-7A ditch profile will provide a velocity of 2.5 FT/Sec with the following dimensions.



CALCULATIONS FOR THE AMOUNT OF CLAY NECESSARY TO CONSTRUCT A 10 FOOT CAY BARRIER WALL AROUND THE OUTER EXTREMETIES OF THE LANDFILL

GIVEN:

1) 10 feet wide
2) Elevation 630.00 at top of wall

STA.	TOP OF CLAY	DISTANCE	AVG. ELEV. AT BOTTOM	630-AVG. x DIST.
0	617.50	120	616.75	1590
1+20	616.00	172	615.00	2580
2+92	614.00	158	613.10	2670
4+50	612.20	20	612.10	358
4+70	612.00	75	612.00	1350
5+45	612.00	345	613.00	5865
8+90	614.00	192	615.00	2880
10+82	616.00	153	616.00	2142
12+35	616.00	290	615.00	4350
15+25	614.00	260	613.00	4420
17+85	612.00	275	613.00	4675
20+60	614.00	170	614.00	2720
22+30	614.00	235	613.50	3878
24+65	613.00	80	613.50	1320
25+45	614.00	60	615.00	900
26+05	616.00	90	617.00	1170
26+95	618.00	35	618.25	411
			TOTAL =	43,279 SF

43,279 SF x 10 FT = 432,785 CUFT = 16,029 CUYD

Phase 5

Average Distance	No. of Cells
x = 170'	7
y = 415'	17
z = 27.5'	4

7 x 17 = 119 vertical cells with 238 sides
119 x 4 = 476 total cells

238 sides per vertical cell x 4 rows = 952 sides

1 side is 24.5' x 6' = 147 SF

952 sides x 147 SF / side = 139,944 SF
= 15,549 SYD

DAILY COVER

6" = 0.166 YD
15,549 SYD x 0.166 YD = 2,590 CUYD

INTERMEDIATE COVER:

415' x 170' = 70,550 SF
= 7,830 SYD

7,839 SYD x 0.333 YD x 3 = 7,831 CUYD

FINAL COVER:

7,839 SYD x 0.666 YD = 5,221 CUYD

Phase 6

Average Distance	No. of Cells
x = 155'	6
y = 395'	16
z = 27.5'	4

6 x 16 = 96 cells with 192 sides
96 x 4 = 384 total cells

192 sides per vertical cell x 4 = 768 sides

768 x 147 = 112,896 SF
= 12,544 SYD

DAILY COVER

12,544 SYD x 0.166 YD = 2,089 CUYD

INTERMEDIATE COVER

395' x 155' = 61,255 SF
= 6,803 SYD

6,083 SYD x 0.333 x 3 = 6,796 CUYD

FINAL COVER:

6,803 SYD x 0.666 YD = 4,531 CUYD

Phase 7

Average Distance	No. of Cells
x = 185'	7
y = 350'	14
z = 21'	3

7 x 14 = 98 cells with 196 sides
98 x 3 = 294 total cells

196 sides per vertical cell x 3 = 588 sides

588 x 147 = 86,436 SF
= 9,604 SYD

DAILY COVER:

9,604 SYD x 0.166 = 1,600 CUYD

INTERMEDIATE COVER:

350' x 185' = 64,750 SF
= 7,194 SYD

7,194 SYD x 0.333 YD x 2 = 7,187 CUYD

FINAL COVER:

7,194 SYD x 0.666 YD = 4,791 CUYD

Phase 8

Average Distance	No. of Cells
x = 635'	26
y = 125'	5
z = 27.5'	4

26 x 5 = 130 cells with 260 sides
130 x 3 = 390 total cells

260 sides per vertical cell x 3 = 780 sides

780 x 147 = 114,660 SF
= 12,740 SYD

DAILY COVER:

12,740 SYD x 0.166 YD = 2,115 CUYD

INTERMEDIATE COVER:

635' x 125' = 79,375 SF
= 8,819 SYD

8,819 SYD x 0.333 YD x 3 = 8,810 CUYD

FINAL COVER:

8,819 SYD x 0.666 YD = 5,873 CUYD

Phase 9

Average Distance	No. of Cells
x = 635'	26
y = 125'	5
z = 31.5'	4

26 x 5 = 130 cells with 260 sides
260 sides per vertical cell x 3 = 780 sides

780 x 147 = 114,660 SF
= 12,740 SYD

DAILY COVER:

12,740 SYD x 0.166 YD = 2,114 CUYD

INTERMEDIATE COVER:

635' x 125' = 79,375 SF
= 8,819 SYD

8,819 SYD x 0.333 YD x 3 = 8,810 CUYD

FINAL COVER:

8,819 SYD x 0.666 YD = 5,873 CUYD

Phase 10

Phase 10 is the same as phase 9.

SUMMATION OF RESULTS

PHASE #	DAILY COVER	INTERMEDIATE COVER	FINAL COVER
5	2,590	7,839	5,221
6	2,089	6,083	4,531
7	1,600	7,187	4,791
8	2,114	8,810	5,873
9	2,114	8,810	5,873
10	2,114	8,810	5,873
TOTALS	12,621	48,259	32,162

Total clay necessary equals (clay barrier wall) + (final clay cover) + (intermediate clay cover) + (daily clay cover)

TCC = (16,029) + (32,162) + (48,259) + (12,621)
= 109,071 CUYD

Total clay available from direct cross sectioning = 37,811 CUYD
Total clay needed to construct phases = 7,145 CUYD

= 30,666 CUYD

109,071 CUYD - 30,666 CUYD = 78,405 CUYD needed

Maximum available in the excavation area = 100,461 CUYD
100,461 > 78,405 o.k.

	CUT	FILL
-0+25	0	0
0+00	0	186
1+00	0	899
2+00	248	713
3+00	2104	31
4+00	2674	0
5+00	3370	0
6+00	388	0
7+00	108	108
8+00	46	62
9+00	310	0

CUT	FILL			
0	186	25	0	[illegible]
0	1085	100	0	108,500
248	1612	100	248,000	161,200
2352	744	100	235,200	74,400
4778	31	100	477800	3100
6044	0	100	604,400	0
3758	0	100	375800	0
496	108	100	49600	10800
154	170	100	15400	17000
356	62	100	35600	6,200
		TOTAL	2,041,800	385,650
		CUBIC FEET	CUT	FILL
			÷54	÷54

JOB NAME	GRIFFITH LANDFILL

VOLUME – CUBIC YARDS	37,811	CUT

JOB NO.	
DATE	

	CUT	FILL	CUT	FILL		
10	8758		17702		90	1,593,180
10+00	8944		18802		100	1,880,200
11+00	9858		19,515		100	1,951,500
12+00	9657					

TOTAL	5,424,880	
CUBIC FEET	CUT	FILL
	÷54	÷54

JOB NAME	GRIFFITH LANDFILL

VOLUME=CUBIC YARDS	100,461	CUT

JOB NO.	
DATE	

Duane Leith
Engineering Section

Griffith Landfill Area Expansion Amendment Review

The proposed area expansion for the Griffith Landfill is unacceptable, as submitted, for the following reasons:

1. The distribution of soil borings is not evenly distributed across the site. The five (5) borings in the proposed fill area are all located near either the east or west boundaries of the site. A large area has no boring data.

2. The plans are not clear as to what elevation the landfill is to be excavated.

3. With either level of excavation specified in the plans, an insufficient natural barrier exists beneath the site to ensure the containment of leachate.

4. The discussion of the hydrogeology of the site is insufficient. A hydrogeological study of the site was requested at the time of the ~~time of~~ operating permit renewal on July 9, 1986. This study has not been submitted. A detailed hydrogeologic study, as specified in Condition No. 2 of the permit renewal letter should be submitted. Based on the results of hydrogeologic study, additional monitoring wells may be required.

5. The applicant should be aware that IC 19-2-1-33, prohibits the establishment of a sanitary landfill within one-half (1/2) mile of recorded subdivisions. If there is public opposition, this may delay or stop permitting. Subdivisions within one-half (1/2) mile of the site should be shown clearly on a plan map.

6. The boundary of the excavation area is unclear. There should not be excavation within the six hundred (600) foot setback. The final contours in this area must be revised.

7. Bench mark locations and monitoring well locations must be shown on a plot plan. The bench mark(s) must provide horizontal as well as vertical control.

8. Clarified the drainage of surface water during operation and on the final cover, showed ditch dimensions, base slopes and base grades of the excavation ~~must be shown~~. DRAINAGE STRUCTURES MUST BE SUFFICIENT TO HANDLE THE RUNOFF FROM A 25 year The pump must be ~~half~~ or below the lowest level of excavation.

9. Cover must be CL, ML, MH, CH or OH type soil, and must be a minimum of two (2) feet thick for slopes less than or equal to fifteen (15) percent, three (3) feet for slopes greater than fifteen (15) and less than or equal to twenty-five (25) percent, and four (4) feet for slopes greater than twenty-five (25) percent. The final cover may not have a slope less than four (4) percent or greater than thirty-three (33) percent. A minimum six (6) inch layer of type soil is required in addition to the above. The correct thickness must be shown on the plans.

10. A careful soil balance analysis of the clay soil available for co... must be conducted, taking into account the higher elevations required at the base of the excavation.

11. The compaction procedures for the recompacted clay walls or liners must be described. Testing procedures for the recompacted clay walls or liners must be specified along with the frequency or location of tests. The frequency of survey points to verify base grades and liner or wall construction should be provided. The wall must also extend along the southeast portion of the new area ~~as well~~. Construction must be certified by registered engineer. The recompaction work in each phase may have to be completed prior to filling.

12. The filling direction and sequence should be clearly shown. A complete set of revised plans and narratives should be submitted to avoid confusion.

13.* A methane monitoring program may be required.

14.* A written closure plan may be required.

15.* A written post-closure plan may be required.

16.* Financial assurance may have to be provided and instituted prior to filling. A description of the financial instrument may have to be provided with the application.

17.* A setback from property boundaries may be one hundred (100) feet instead of the current fifty (50) feet.

18.* The name and address of all owners or taxpayers within one (1) mile of the proposed solid waste boundary may have to be submitted.

19.* A one thousand and two hundred (1200) foot setback may have to be maintained from any public water supply well, unless written consent is obtained from the owner, if any are within one thousand two-hundred (1200) feet.

20.* A leachate collection system may be required.

*These items will be required if/when the new regulations are promulgated.

DL/rnw

6249k rnw 8/22/88